MONTANA FISH, WILDLIFE & PARKS
FISHERIES DIVISION

Environmental Assessment of the rotenone treatment of Blue Lake for the purpose of removing northern pike, yellow perch, redside shiners, and pumpkinseed sunfish and restocking to create a mixed trout fishery.

PART I: PROPOSED ACTION DESCRIPTION

A. Type of Proposed Action: Improve angling quality and diversity of angling opportunity.

B. Agency Authority for the Proposed Action: Montana Fish, Wildlife & Parks (FWP) "…is hereby authorized to perform such acts as may be necessary to the establishment and conduct of fish restoration and management projects…" under statute 87-1-702.

C. Estimated Commencement Date: October 2006

D. Name and Location of the Project: Improve angling quality of Blue Lake through removal of northern pike, yellow perch, and pumpkinseed sunfish (and other species –see below) by means of rotenone piscicide and restock with brook trout, Kamloops rainbow trout, and westslope cutthroat trout.

The project site is located in Flathead County approximately 1 mile south of the town site of Stryker, Montana; T33N, R25W, Sec 1, 2 and T34N, R25W, Sec 35, 36 (Figure 1). The lake is located exclusively on Kootenai National Forest land and some of the inlet stream is located on the Stillwater State Forest land.

E. Project Size (acres affected)

1. Developed/residential – 0 acres
2. Industrial – 0 acres
3. Open space/Woodlands/Recreation – 0 acres

4. Wetlands/Riparian – The lake is 14.1 acres in size, has a maximum depth of 76 feet and is 491 acre feet in volume (Figure 2). There is no known outlet from this lake. The only tributary to Blue Lake is a stream on the northwest shore. It was gauged at 0.57 cfs in July of 2006. The length of this stream is approximately 1.1 miles long.

5. Floodplain – 0 acres
6. Irrigated Cropland – 0 acres
7. Dry Cropland – 0 acres
8. Forestry – 0 acres
9. Rangeland – 0 acres

F. Narrative Summary of the Proposed Action and Purpose of the Proposed Action

The Montana statewide angler pressure estimates since 1991 indicate Blue Lake provides an average of 241 angler days per year (37 – 498). The lake has a history of providing quality angling for brook trout. Interviews with residents in the Whitefish area indicate Blue Lake used to produce brook trout up to 15 inches in length. In the early 1970s and '80s FWP gillnetting surveys detected the presence of redside shiners and pumpkinseed sunfish. The decline of brook trout in Blue Lake was evaluated in 1989 and the conclusion was that the principal reasons for the decline of the brook trout were due to the presence of redside shiners and pumpkinseed sunfish and several years of drought. At that time, FWP considered several management alternatives including treating the lake with rotenone to remove the shiners and sunfish, then restocking with rainbow trout, and relying on natural brook trout production in the inlet stream. In the 1990s other species including burbot, northern pike, and yellow perch were discovered in the lake, apparently introduced by unauthorized parties. Gillnetting in 2006 indicated that yellow perch, northern pike, pumpkinseed sunfish, redside shiners, and rainbow trout are the primary species in the lake. The lake is stocked with approximately 1,000 rainbow trout every other year.

The proposed action is to remove all of the fish in Blue Lake using the piscicides Prenfish (5% liquid rotenone) and Prentox (7% powder rotenone), then restock the lake with brook trout, rainbow trout and westslope cutthroat trout. Since 1987, FWP has instituted a voluntary moratorium on the stocking of brook trout and restricted the stocking of brook trout into private ponds for the purpose of safeguarding and recovering the bull trout from threatened species status under the federal Endangered Species Act. The moratorium is currently being evaluated. During the time between the fish removal from Blue Lake and the proposed restocking time, the criteria for brook trout stocking will be worked out using the present rainbow trout stocking policy as a template. The principle reasons Blue Lake was chosen as a candidate for restoring brook trout angling are: 1) it has a history of providing quality angling for brook trout, 2) the lake has no outflow, and 3) it is not connected to any bull trout population, and it would not pose a threat to any bull trout population in the Stillwater River drainage.

FWP has a long history of using rotenone to manage fish populations in northwestern Montana. From 1948 through 2005, the department has administered 128 rotenone projects for a variety of reasons, but principally to improve angling quality or for native fish conservation.

Rotenone is a naturally occurring substance derived from the roots of tropical plants in the bean family such as the jewel vine (*Derris* spp.) and lacepod (*Lonchocarpus* spp.) that are found in Australia, Oceania, southern Asia, and South America. Rotenone has been used by native people for centuries to capture fish for food in areas where these plants are naturally found. It has been used in fisheries management in North America since the 1930s. Rotenone has also been used as a natural insecticide for gardening and to control parasites such as lice on domestic livestock.

Rotenone acts by inhibiting oxygen transfer at the cellular level. It is especially effective at low concentrations with fish because it is readily absorbed into the bloodstream through the thin cell layer of the gills. Mammals and other nongill-breathing organisms do not have this rapid absorption route into the bloodstream, and thus can tolerate exposure to concentrations much

higher than that used to kill fish. In essence, most nontarget organisms are not affected at fish killing concentrations.

The boundaries for this treatment span from the uppermost reach of the stream downstream to the lake, and the lake itself. The waters between these two points would be treated primarily with Prenfish 5% liquid rotenone, which would be contained within these boundaries. Although surveys have detected no springs in the lake, a small amount of powdered rotenone (Prentox 7% rotenone) may be used to treat springs to prevent fish from seeking them as freshwater refuges during the application. We would follow the label recommendations for concentrations for "normal pond use" when treating the lake and connecting waters. On-site bioassays using caged fish would determine the appropriate concentrations needed, which is estimated to be near 1 mg of Prenfish per 1 liter of water. Blue Lake has a volume of 491 acre-feet, which means we would use approximately 164 gallons of Prenfish to achieve 1 mg/L. The persistence of Prenfish in the lake would be three to five weeks depending on the amount of fresh water entering the lake from the stream, water temperatures, sunlight intensity, and alkalinity.

The rotenone would be dispensed in the lake by boat. Drip stations would be used to dispense the rotenone in the inlet stream, and the marshy areas around the lakes would be treated with backpack sprayers and pumps. The materials and equipment would be transported to the site by a truck. The stream is located in heavily wooded forest. It has a relatively steep gradient near the lake, but becomes relatively low gradient approximately 100 yards upstream of the mouth.

The treatment period for the stream would last for an estimated 8 hours to remove fish from the stream. When the stream treatment ends, fresh water would begin to enter the lake and dilute the rotenone in the lake. We would install a drip station near the mouth of the stream to prevent fresh water from diluting the lake water too soon. This drip station would run for another 8 hours. Caged fish would be used to measure the toxicity of the water in the stream and lake. After the treatment of the stream and lake, we would use caged fish to evaluate when the waters have naturally detoxified. The rotenone label specifies that once caged fish survive 24 hours in treated water, it is considered detoxified and is safe for restocking.

Dead fish that surface would be left on-site in the water or disposed of properly. Studies in Washington State indicate that approximately 70% of rotenone-killed fish sink to the bottom (Bradbury 1986). Dead fish stimulate plankton growth and aid in plankton recovery.

If unforeseen circumstances confound the success of this project, it may be necessary to implement a second treatment to achieve the desired objectives. This treatment may be conducted immediately after the first treatment, or the following October. In the event that a second treatment is necessary one year later, a supplemental analysis to this EA will be prepared.

Monitoring is a major component of this type of management activity. By way of example, FWP conducted extensive monitoring of the 2005 rotenone treatment of Martin lakes near Olney. The results indicate the stream naturally detoxified with dilution from fresh water within 48 hours. Although very little freshwater was flowing into the Martin lakes, the water was no longer toxic to fish after 5 weeks. Plankton blooms occurred in Martin Lakes 160 days after the treatment. Columbia spotted frogs were observed depositing eggs in Martin Lakes the following spring.

FWP has extensive experience conducting this type of monitoring, and we would employ a similar strategy on Blue Lake.

The lake would be restocked with fish the following spring. FWP file data indicate the stream provides good spawning for brook trout. The department has secured a source of disease-free brook trout from a hatchery within the state. We would also stock Kamloops rainbow and westslope cutthroat trout from the Murray Springs State Fish Hatchery.

Funding

The proposed action would be funded by Bonneville Power Administration (BPA) through the Hungry Horse Dam Fisheries Mitigation Program. As such, BPA must evaluate this action to be compliant with the National Environmental Policy Act. In 2003 BPA completed the Fish and Wildlife Implementation Plan Environmental Impact Statement (DOE/EIS-0312), which evaluates the impacts that may arise from implementing any of the fish and wildlife policy directions considered in the regional processes (BPA 2003). The type of action proposed in this MEPA EA has been evaluated in the EIS. BPA will provide a Supplemental Analysis to the EIS that lists the details of this project in order to fulfill their compliance with NEPA and ultimately fund this project (See Sections 5.2.2.3, 5.2.3.4, 5.3.1.3, pages 5-98 through 5-100).

PART II. ENVIRONMENTAL REVIEW

A. PHYSICAL ENVIRONMENT

1. LAND RESOURCES Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Soil instability or changes in geologic substructure?		X				
b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil, which would reduce productivity or fertility?		X				
c. Destruction, covering, or modification of any unique geologic or physical features?		X				
d. Changes in siltation, deposition, or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?		X				
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard?		X				

2. WATER Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen, or turbidity?			X		Yes	2a
b. Changes in drainage patterns or the rate and amount of surface runoff?		X				
c. Alteration of the course or magnitude of floodwater or other flows?		X				
d. Changes in the amount of surface water in any water body or creation of a new water body?		X				
e. Exposure of people or property to water related hazards such as flooding?		X				
f. Changes in the quality of groundwater?		X				2f
g. Changes in the quantity of groundwater?		X				
h. Increase in risk of contamination of surface or groundwater?			X		Yes	See 2a & f
i. Effects on any existing water right or reservation?		X				
j. Effects on other water users as a result of any alteration in surface or groundwater quality?		X				
k. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				
l. Will the project affect a designated floodplain?		X				
m. Will the project result in any discharge that will affect federal or state water quality regulations? (Also see 2a)			X		Yes	2m

Comment 2a. This project is designed to intentionally introduce a pesticide to surface water to remove unwanted fish. The impacts would be short term and minor. Prenfish (5%liquid) and Prentox (7%powder) rotenone are EPA registered pesticides and are safe to use for removal of unwanted fish, when handled properly. The concentration of Prenfish rotenone proposed is approximately 1 mg per 1 liter of water, but may be adjusted within the label allowed limits based upon the results of on-site assays. Although no springs were found during pretreatment surveys, if any are discovered, we would use Prentox powder in small quantities to prevent fish from entering spring sources.

There are three ways in which rotenone can be detoxified once applied. The most common method is to allow natural breakdown to occur. Rotenone is a compound that is susceptible to

natural breakdown (detoxification) through a variety of mechanisms such as water chemistry, water temperature, exposure to organic substances, exposure to oxygen, and sunlight intensity (Ware 2002; ODFW 2002; Loeb and Engsrtom-Heg 1970; Engstrom-Heg 1972; Gilderhus et al. 1986). Rotenone persistence studies by Gilderhus et al. (1986) and Dawson et al. (1991) found that in cool water temperatures of 32 to 46^{o}F the half-life ranged from 3.5 to 5.2 days. Gilderhus et al. (1986) reported that 30% mortality was experienced in rainbow trout exposed to degrading concentrations of actual rotenone (0.004 ppm) in 46^{o}F pond water 14 days after a treatment. By day 18 the concentrations were sublethal to trout. The second method for detoxification involves basic dilution by fresh water. This may be accomplished by fresh ground water or surface water flowing into a lake or stream. The final method of detoxification involves the application of an oxidizing agent like potassium permanganate. This dry crystalline substance is mixed with stream or lake water to produce a concentration of liquid sufficient to detoxify the concentration of Prenfish applied. Detoxification is accomplished after about 20-30 minutes of mixing between the two compounds (Prentiss Inc. 1998). As there is no outlet of Blue Lake, we will rely on freshwater dilution to detoxify the stream water and the lake water. Based on recent monitoring of the rotenone treatment of Martin Lakes near Olney in 2005, we expect the stream to detoxify within 48 hours after the drip stations are removed, and we expect the lake to detoxify within 3 to 5 weeks.

Dead fish would result from this project. Bradbury (1986) reported that approximately 70% of rotenone fish killed in Washington lakes never surface. Although no trout were involved with his study, Parker (1970) reported that at water temperatures of 40^{o}F and less, dead fish required 20-41 days to surface. The most important factors inhibiting fish from ever surfacing are cooler water (<50^{o}F) and deep water (>15 feet). Blue Lake would undoubtedly meet these criteria during an October treatment. Bradbury (1986) reported that 9 of 11 water bodies in Washington treated with rotenone experienced an algae bloom shortly after treatment. This is attributed to the input of phosphorus to the water as a result of decaying fish. Bradbury further notes that approximately 70% of the phosphorus content of the fish stock would be released into the lake through bacterial decay. This action stimulates phytoplankton production, then zooplankton production, and starts the lake toward production of food for fish. This change in water chemistry is viewed as a benefit to stimulate plankton growth. Any changes or impacts to water quality resulting from decaying fish would be short term and minor.

In July 2006 the creek flowing into the lake was surveyed. The inflow was gauged at 0.57 cfs. The site was visited in early August, and the stream flows had decreased some. The freshwater inputs from this stream would serve to dilute treated water below fish killing concentrations.

Comment 2f: No contamination of groundwater is anticipated to result from this project. It is known that Blue Lake receives surface water from its inlet stream at the rate of 0.57 cfs, but it has no surface outflow. Based on this, water must leach out of the lake through its bed. Rotenone binds readily to sediments and is broken down by soil and in water (Skaar 2001; Engstrom-Heg 1971, 1976; Ware 2002). Rotenone moves only one inch in most soil types; the only exception would be sandy soils where movement is about three inches (Hisata 2002). In California, studies where wells were placed in aquifers adjacent to and downstream of rotenone applications have never detected rotenone, rotenolone, or any of the other organic compounds in the formulated products (CDFG 1994). Case studies in Montana have concluded that rotenone

movement through groundwater does not occur. For example, at Tetrault Lake, Montana, rotenone was not detected in a nearby domestic well, which was sampled two and four weeks after applying 90 ppb rotenone to the lake. This well was chosen because it was down gradient from the lake and also drew water from the same aquifer that fed and drained the lake. In 1998, a Kalispell area pond was treated with Prenfish. Water from a well, located 65 feet from the pond, was analyzed and no sign of rotenone was detected. In 2001, another Kalispell area pond was treated with Prenfish. Water from a well located 200 feet from that pond was tested four times over a 21-day period and showed no sign of contamination. In 2005, FWP treated a small pond with Prenfish to remove pumpkinseeds and bass. A well located 30 yards from the pond was tested and no evidence of Prenfish was found in the well.

Because water leaving Blue Lake must travel through lake sediments, soil, and gravel, and it is known to bind readily with these substances, we do not anticipate any contamination of ground water.

Comment 2m: FWP would apply for an exemption of surface water quality standards from Montana DEQ under section 308 of the Montana Water Quality Act.

3. AIR **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Emission of air pollutants or deterioration of ambient air quality? (Also see 13 (c))			X			3a
b. Creation of objectionable odors?			X		Yes	3b
c. Alteration of air movement, moisture, or temperature patterns or any change in climate, either locally or regionally?		X				
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X				
e. Will the project result in any discharge, which will conflict with federal or state air quality regs?		X				

Comment 3a: Emissions from outboard motors would be created, but are expected to dissipate rapidly. Any impacts from these odors would be short term and minor.

Comment 3b: Liquid-formulated rotenone does contain aromatic solvents that make it soluble in water. This smell of these solvents may last for several hours to several days, depending on air and water temperatures and wind direction. These relatively "heavy" organic compounds tend to sink (remain close to the ground) and move downwind. The California Department of Pesticide Regulation (CDPR 1998, cited in Finlayson et al. 2000) found no health effects from this smell. Applicators would have the greatest contact with these odors, but would be protected because

they would be wearing respirators as the product label recommends. Any impacts caused by objectionable odors would be short term and minor.

Dead fish would result from this project and may cause objectionable odors. This condition is greatly reduced during fall applications. This will be mitigated by collecting and/or sinking dead fish in the lake. We would expect odors from dead fish to be short term and minor.

4. VEGETATION **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?			X			4a
b. Alteration of a plant community?		X				
c. Adverse effects on any unique, rare, threatened, or endangered species?		X				
d. Reduction in acreage or productivity of any agricultural land?		X				
e. Establishment or spread of noxious weeds?		X				
f. Will the project affect wetlands, or prime and unique farmland?		X				

Comment 4a: Blue Lake is located in a forested area with one rudimentary boat ramp to stage this operation from. There are two large parking areas near the lake. There should be no trampling of vegetation around the lake. There will be some trampling of vegetation along the stream during the placement and monitoring of drip stations and sentinel fish locations. Rotenone does not have an effect on plants at concentrations used to kill fish. Impacts from trampling vegetation are expected to be short term and minor.

5. FISH/WILDLIFE **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Deterioration of critical fish or wildlife habitat?		X				
b. Changes in the diversity or abundance of game animals or bird species?			X		Yes	5b
c. Changes in the diversity or abundance of nongame species?			X		Yes	5c
d. Introduction of new species into an area?			X			5d
e. Creation of a barrier to the migration or movement of animals?		X				
f. Adverse effects on any unique, rare, threatened, or endangered species?	X					5f

g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?		X				5g
h. Will the project be performed in any area in which T&E species are present, and will the project affect any T&E species or their habitat? (Also see 5f)		X				
i. Will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d)			X			See 5d

Comment 5b: This project is designed to kill unwanted fish. Northern pike are a game species that would be eliminated from Blue Lake. FWP stocks the lake with rainbow trout, and brook trout have been found in the stream during an electrofishing survey in 2006. No other fish species were observed in the stream. Other species that would be killed incidental to this project include pumpkinseed sunfish, redside shiners, and yellow perch. These impacts would be short term and minor because the lakes would be restocked with rainbow trout, brook trout, and westslope cutthroat trout. Brook trout would also pioneer sections of the stream as this species has in the past.

Comment 5c: Nongame (nontarget) species that would be impacted include zooplankton, some aquatic insects, crustaceans (crayfish), and possibly some amphibians. In July and August 2006, surveys were conducted on the lake and stream for amphibians and reptiles, which resulted in observing the common garter snake, western terrestrial garter snake, western toad, and Columbia spotted frog. All four species were in low abundance. Large crayfish were observed in abundance near the inlet stream in August 2006. Based on the results of other rotenone treatments in northwestern Montana, we would expect crayfish to survive the treatment of blue Lake as they have in other lakes.

Numerous studies indicate that rotenone has temporary or minimal effects on aquatic insects and plankton. Anderson (1970) reported that comparisons between samples of zooplankton taken before and after a rotenone treatment did not change a great deal. Despite the inherent natural fluctuations in zooplankton communities, the application of rotenone had little effect on the zooplankton community. Cook and Moore (1969) reported that the application of rotenone has little lasting effect on the nontarget insect community of a stream. Kiser et al. (1963) reported that 20 of 22 zooplankton species reestablished themselves to pretreatment levels within about 4 months of a rotenone application. Cushing and Olive (1956) reported that the insects in a lake treated with rotenone exhibited only short-lived effects. Hughey (1975) concluded that three Missouri ponds treated with rotenone showed little short-term and no long-term effect on population levels of zooplankton. The effects of rotenone on plankton were consistent with the natural variability that is characteristic of plankton populations, and recolonization was rapid and reached near pretreatment levels within eight months.

Both Anderson (1970) and Kiser et al. (1963) reported that most zooplankton species survive a rotenone treatment via their highly resilient egg structures. In addition, parthenogenesis of some female plankton occurs, causing sexual dimorphism, which greatly increases plankton density in times of population distress. Among the aforementioned studies variation in climate, physical environment, and water chemistry would likely cause subtle differences in results in other areas.

Case studies conducted on Devine Lake in the Bob Marshall Wilderness from 1994-1996 indicate that invertebrates actually increased in number and very slightly increased in diversity following a rotenone treatment (Rumsey et al. 1996). This is supported by observations made by Cushing and Olive (1956), who reported that oligochaetes (worms) increased in number after a rotenone treatment, then became stable. *Gammarus* species (fresh water shrimp), a common fish food item, were detected in Devine Lake only when fish were present. Neighboring Ross Lake, in the Bob Marshall Wilderness, is fishless and was used to measure natural insect and plankton variation during the Devine Lake treatment and evaluation. *Gammarus* species were never detected in Ross Lake, although it is fishless. Invertebrate numbers in Ross Lake were reported to be relatively stable, but the diversity of insects fluctuated considerably over time.

The most recent example of monitoring plankton after a rotenone treatment involves that of Martin Lakes near Olney in 2005. The monitoring showed that posttreatment species composition is the same as the pretreatment composition, and by eight months post treatment, density was lower than pretreatment levels. Based on this, we would expect the impacts to these nontarget organisms to be similar. Because there are natural fluctuations in plankton densities, we would expect the species composition in Blue Lake to return to pretreatment, and the density may range from less than pretreatment levels to similar to pretreatment levels.

The effects of rotenone on nontarget organisms have been studied extensively. Mammals in general are not affected because they neutralize rotenone by enzymatic action in their stomach and intestines (AFS 2002). Laboratory tests fed forms of rotenone to rats and dogs as part of their diet for periods of six months to two years (Marking 1988). Researchers observed effects such as diarrhea, decreased food consumption, and weight loss, and reported that despite unusually high treatment concentrations of rotenone in rats and dogs, it did not cause tumors or reproductive problems in mammals. CDFG (1994) studies of risk for terrestrial animals found that a 22-pound dog would have to drink 7,915 gallons of lake water within 24 hours, or eat 660,000 pounds of rotenone-killed fish, to receive a lethal dose. The state of Washington reported that a half pound mammal would need to consume 12.5 mg of pure rotenone to receive a lethal dose (Bradbury 1986). Considering the only conceivable way an animal can consume the compound under field conditions is by drinking lake or stream water, a half pound animal would need to drink 33 gallons of water treated at 2 ppm. Brooks (1961) reported that this amount is more on the order of 49 gallons. Similar results determined that birds required levels of rotenone at least 1,000 to 10,000 times greater than is required for lethality in fish (Skaar 2001). Cutkomp (1943) reported that chickens, pheasants, and members of lower orders of *Galliformes* were quite resistant to rotenone, and four day old chicks were more resistant than adults. Ware (2002) reports that swine are uniquely sensitive to rotenone, and it is slightly toxic to wildfowl, but to kill Japanese quail required 4,500 to 7,000 times more than is used to kill fish. One study, in which rats were injected with rotenone for a period of weeks, reported finding lesions characteristic of Parkinson's disease (Betarbet et al. 2000). However, the results have been

challenged on the basis of methodology: (1) that the continuous intravenous injection method used leads to "continuously high levels of the compound in the blood," and (2) that dimethyl sulfoxide (DMSO) was used to enhance tissue penetration (normal routes of exposure actually slow introduction of chemicals into the bloodstream). Finally, injecting rotenone into the body is not a normal way of assimilating the compound. Similar studies (Marking 1988) have found no Parkinson-like results. Extensive research has demonstrated that rotenone does not cause birth defects (HRI 1982), gene mutations (Van Geothem et al. 1981; BRL 1982), or cancer (Marking 1988). Rotenone was found to have no direct role in fetal development of rats that were fed excruciatingly high concentrations of rotenone. Spencer and Sing (1982) reported that rats that were fed diets laced with 10-1,000 ppm rotenone over a 10-day period did not suffer any reproductive dysfunction. Typical concentrations of actual rotenone used in fishery management range from 0.025 to 0.50 ppm and are far below that administered during most toxicology studies.

Chandler and Marking (1982) found that clams and snails were between 50 and 150 times more tolerant than fish to Noxfish (5% rotenone formulation), and southern leopard frog tadpoles were between 3 and 10 times more tolerant than fish. Grisak et al. (in prep) conducted laboratory studies on longtoed salamanders, tailed frogs, and Columbia spotted frogs and concluded that the adult life stages of these species would not suffer an acute response to rotenone, but the larval and tadpole stages could be affected by rotenone at fish-killing concentrations. These authors recommended implementing rotenone treatments at times when the larvae and tadpoles are not present, such as the fall, to reduce exposure to these species and reduce potential for impacts.

It is important to note that nearly all of these examples involved subjecting laboratory specimens to unusually high concentrations of rotenone or conducting tests on animals that would not be exposed to rotenone during normal use in fisheries management.

Based on this information we would expect the impacts to nontarget organisms to range from nonexistent to short term and minor. A survey in July 2006 confirmed a small number of Columbia spotted frogs at the site, and western terrestrial garter snakes have been observed at the lake.

Comment 5d: This project is designed to restore brook trout angling to Blue Lake, continue stocking rainbow trout, and introduce the westslope cutthroat trout. Although the westslope cutthroat trout would be a new addition into Blue Lake, this species is compatible with the other species proposed for restocking, and all species would be contained within the lake basin due to the absence of a lake outflow. Blue Lake is located within the historic range of the westslope cutthroat trout (see comment 5i).

Comment 5f: Dead fish would result from this project. It is possible that osprey or eagles would use rotenone-killed fish. There are five bald eagle nests located within 9 miles of the project site. They are: Murphy Lake #1, Murphy Lake # 2, Upper Whitefish Lake, Upper Stillwater Lake, and Lower Stillwater Lake (Figure 3). Eagles using these nests have had varying success with nesting attempts and fledging young over the past five years. The Murphy Lake nests have produced young in the past three years and have successfully fledged young in 11 of the past 13 years. The Upper Stillwater Lake nest has produced young one time during the past six years,

and the last time the Lower Stillwater nest produced young was 1999. The status of the Upper Whitefish Lake nests is unknown. Observers who catalogue activity at this site have not reported any activity in recent years. Conducting this project in the fall would not impact bald eagle nesting, and there would be no impacts to bald eagles that consume rotenone-killed fish. The lake would be restocked with fish the following year, so there would be no impacts to bald eagles. See comment 5c for impacts to birds.

Grizzly bears are known to be in this area, but are not dependant on the lake or fish in the lakes for food. The infrequent sighting of grizzly bears, human activity in the area, and cleaning dead fish from the site would contribute to reducing potential for this species to consume rotenone-killed fish. See comment 5c for impacts to mammals. The project would not have an impact on grizzly bears.

The project site is within the range of the gray wolf. The Murphy Lake pack may use this area at times, but is not dependant on the lake or fish in the lake for food. The impacts to this species would be nonexistent for the same reasons as the grizzly bear. See comment 5c for impacts to mammals.

The common loon is known to use this lake for foraging, but no nests have been observed at the lake. There may be a short-term and minor impact to loons that use Blue Lake for feeding on yellow perch and pumpkinseeds. Loons may use other fish species that get restocked into the lake as a food source, or rely on fish from neighboring lakes. See comment 5c for impacts to birds.

Given that the lake has public access, it is located near a highway and near an active rail line, increased activity associated with this project would not disrupt any of the aforementioned T&E species or species of concern.

On July 21, 2006, FWP contacted the US Fish and Wildlife Service to determine if the department needed to consult with the Service about T&E species in the project area. FWP determined that there would be “no effect” to T&E species, so no formal consultation with the Service is necessary.

Comment 5g. There is one active beaver lodge at the north end of the lake. Beavers would not be affected by this project (see comment 5c for impacts to mammals). Beavers were observed prior to the rotenone treatment of Martin Lakes near Olney in 2005. Monitoring surveys conducted after the treatment showed that beavers were still present and did not experience any apparent negative impacts from that project. We would expect the same results for Blue Lake.

Comment 5i. See comment 5d with regard to introducing the westslope cutthroat trout to Blue Lake.

B.HUMAN ENVIRONMENT

6. NOISE/ELECTRICAL EFFECTS Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Increases in existing noise levels?			X			6a
b. Exposure of people to serve or nuisance noise levels?		X				
c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X				
d. Interference with radio or television reception and operation?		X				

Comment 6a: Blue Lake is located close to the town of Stryker and is very near an active rail line and highway. The lake has a boat ramp that receives regular use from the public. The only noise generated from this project would be from an outboard motor, but is consistent with present levels. The noise generated from this would be short term and minor.

7. LAND USE Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X				
b. Conflicted with a designated natural area or area of unusual scientific or educational importance?		X				
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?	X					7c
d. Adverse effects on or relocation of residences?		X				

Comment 7c: The project is proposed for a time period when the general archery hunting and mountain grouse hunting seasons are open. Activity along the stream during this project may displace some animals sought for this type of hunting. Any impacts from this displacement would be short term and minor. The main access road to the lake would be closed during the treatment.

8. RISK/HEALTH HAZARDS Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?			X		Yes	8a
b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan?			X		Yes	8b
c. Creation of any human health hazard or potential hazard?			X		Yes	See 8a & c
d. Will any chemical toxicants be used?			X		Yes	See 8a

Comment 8a: The principal risk of human exposure to hazardous materials from this project would be limited to the applicators. All applicators would wear safety equipment listed on the product labels such as respirator, goggles, rubber boots, Tyvek overalls, and nitrile gloves. All applicators would be trained on the safe handling and application of the piscicide. At least one, and most likely several, Montana Department of Agriculture certified pesticide applicators would supervise and administer the project. Rotenone would be transported, handled, applied, and stored according to the label specifications to reduce the probability of human exposure or spill.

Comment 8b: FWP has a treatment plan for rotenone projects. This plan addresses many aspects of safety for people who are on the implementation team such as establishing a clear chain of command, training, delegation and assignment of responsibility, clear lines of communication between members, spill contingency plan, first aid, emergency responder information, personal protective equipment, monitoring, and quality control, among others. Implementing this project should not have any impact on existing emergency plans. Because an implementation plan has been developed by FWP the risk of emergency response is minimal and any effects to existing emergency responders would be short term and minor.

Comment 8c: (Cited from BPA 2004) Although pesticides are used widely to control unwanted species, legitimate public concerns have been raised regarding the safety and health effects to humans. As with any pesticide, direct exposure to, or consumption of, piscicides at full strength can have harmful or sometimes fatal effects on humans. Rotenone is an EPA-registered pesticide under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). There are no federal or Montana numeric water quality standards for rotenone; however, MDEQ (2001) used the EPA method of calculating human health criteria based on noncarcinogenic effects to estimate a safe level for lifelong exposure to water and the consumption of fish exposed to water containing rotenone: 40µg/L water plus fish. The calculation is based on several assumptions:

- Long-term (70 years) exposure.
- Average body mass of 70 kg (BW).
- A person consumes 2 L of water per day (DI).
- A person consumes 0.0065 kg of fish per day (FI).

• Reference Dose (RfD) for rotenone = 0.004 mg/kg-day (from EPA, Integrated Risk Information System, IRIS).
• Some chemicals tend to increase in fish tissue over the concentration in the water or bio-concentrate. The amount the chemical increases in the fish relative to the ambient concentration is the bio-concentration factor (BCF). The BCF does not include possible food chain effects.

The calculation of the Rotenone criteria is as follows:

0.004 mg/kg-day (RfD) * 70 kg (BW)
2 L/day (DI) + (0.0065 kg/day (FI) * 770 L/kg (BCF))

The rotenone formulation that would be used contains five percent active ingredient. When the formulation is applied to achieve 1 mg/L in the water body, the active ingredient concentration is 0.05 mg/L or 50 µg/L. The target concentration would be 10µg/L above the calculated long-term safe level. But the long-term safe level was determined using the standard assumption that fish would be exposed to rotenone and be able to bio-concentrate rotenone. This assumption is extremely protective. Rotenone is a natural chemical, but is not naturally found in Montana and is not a chemical likely to be found in fish that are commercially available for consumption. Fish exposed to rotenone at the target concentration would die within two to three hours; thus bio-concentration is very unlikely. Most of the dead fish in the treated lakes would sink to the bottom of the lake. Fish that wash up during the crew's presence at the lake would be collected for disposal. The potential long-term risk to humans with water as their only source of rotenone exposure yields 140µg/L as a safe long-term concentration.

Since tissue and water concentrations of rotenone decline quickly after a treatment, and people would not likely be exposed to treatments on a continual basis, hazardous lifelong exposure to rotenone is extremely unlikely. Public health issues surrounding the use of rotenone have been studied extensively. In general, the EPA through FIFRA certification process has concluded that the use of rotenone for fish control does not present a risk of unreasonable, adverse effects to humans and the environment (Finlayson et al. 2000) as long as the label instructions are followed.

In their description of how South American Indians prepare and apply *Timbó*, a rotenone parent plant, Teixeira et al. (1984) reported that the Indians extensively handled the plants during a mastication process, and then swam in lagoons with the plant pulp on their backs for distribution. No harmful effects were reported.

Finlayson et al. (2000) reported that the EPA "has concluded that the use of rotenone for fish control does not present a risk of unreasonable adverse effects to humans and the environment." In relation to air quality, they further note that "no public health effects from rotenone use as a piscicide have been reported." No waiting period is specified for swimming in rotenone-treated water.

Aside from the rotenone itself, liquid formulations also consist of petroleum emulsifiers. Finlayson (2000) wrote regarding the health risks of these constituent elements:

> " . . . the EPA has concluded that the use of rotenone for fish control does not present a risk of unreasonable adverse effects to humans and the environment. The California Environmental Protection Agency found that adverse impacts

> from properly conducted, legal uses of liquid rotenone formulations in prescribed fish management projects were nonexistent or within acceptable levels (memorandum from J. Wells, California Department of Pesticide Regulation, to Finlayson, 3 August 1993). Liquid rotenone contains the carcinogen trichloroethylene (TCE). However, the TCE concentration in water immediately following treatment (less than 0.005 mg TCE per liter of water [5 ppb]) is within the level permissible in drinking water (0.005 mg TCE per liter of water, EPA 1980b). None of the other materials including xylenes, naphthalene, piperonyl butoxide, and methylnaphthalenes exceed any water quality criteria guidelines (based on lifetime exposure) set by the EPA (1980a, 1981a, 1993). Many of these materials in the liquid rotenone formulations (trichloroethylene, naphthalene, and xylene) are the same as those found in fuel oil and are present in waters everywhere because of the frequent use of outboard motors . . .”

California Department of Fish and Game (CDFG, 1994) calculated that the maximum expected level of these contaminants following a treatment level of 2 ppm formulation are TCE 1.1 ppb; toluene 84 ppb; xylenes 3.4 ppb; naphthalene 140 ppb. The product label states:

> “ . . . do not use dead fish for food or feed, do not use water treated with rotenone to irrigate crops or release within ½ mile upstream of a potable water or irrigation water intake in a standing body of water such as a lake, pond, or reservoir. . . . do not allow swimming in rotenone-treated water until the application has been completed and all pesticide has been thoroughly mixed into the water according to the labeling instructions. This product is flammable and should be kept away from heat and open flame . . .”

The major risks to human health from rotenone come from accidental exposure during application. This is the only time when humans are exposed to concentrations that are greater than that needed to remove fish. To prevent accidental exposure to liquid-formulated or powdered rotenone, the Montana Department of Agriculture requires applicators to be:

- Trained and certified to apply the pesticide in use.
- Equipped with the proper safety gear, which, in this case, includes fitted respirator, eye protection, rubberized gloves, hazardous material suit.
- Have product labels with them during use.
- Contain materials only in approved containers that are properly labeled.
- Adhere to the product label requirements for storage, handling, and application.

Any threats to human health during application could be greatly reduced with proper use of safety equipment. Recreationists in the area would likely not be exposed to the treatments because a temporary road closure would preclude many from being in the area. Proper warning through news releases, signing the project area, road closure, and administrative personnel in the project area should be adequate to keep unintended recreationists from being exposed to any treated waters. Dead fish would be collected and sunk in the lakes or removed from the site. Administering application in the fall of the year would further reduce exposure due to the relatively low number of users in this area.

There is an inhalation risk to ground applicators. To guard against this, ground applicators would be equipped with protective clothing, eye, and breathing equipment.

9. COMMUNITY IMPACT **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X				
b. Alteration of the social structure of a community?		X				
c. Alteration of the level or distribution of employment or community or personal income?		X				
d. Changes in industrial or commercial activity?		X				
e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X				

10. PUBLIC SERVICES/TAXES/UTILITIES **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify: _____		X				
b. Will the proposed action have an effect upon the local or state tax base and revenues?		X				
c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications?		X				
d. Will the proposed action result in increased used of any energy source?		X				
e. Define projected revenue sources		X				
f. Define projected maintenance costs		X				

11. AESTHETICS/RECREATION Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?		X				
b. Alteration of the aesthetic character of a community or neighborhood?		X				
c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report)			X		Yes	See 11c
d. Will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c)		X				

Comment 11c: There will be a temporary loss of angling opportunity at Blue Lake between the fish removal and the restocking. However, this project is specifically intended to improve angling quality at Blue Lake, which may result in increased use by recreationists. The benefits of increased recreational use would outweigh any impacts associated with the actual treatment. Any impacts to aesthetics would be short term and minor and be directly associated with the actual rotenone treatment and immediate aftermath, including dead fish in the project area. A tourism report is not necessary to quantify these impacts.

12. CULTURAL/HISTORICAL RESOURCES Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance?		X				
b. Physical change that would affect unique cultural values?		X				
c. Effects on existing religious or sacred uses of a site or area?		X				12c
d. Will the project affect historic or cultural resources?		X				

Comment 12 c. The project site is located within the aboriginal range of the Kootenai Tribe of Idaho and the Confederated Salish and Kootenai Tribes of the Flathead Nation. In July 2006, cultural officers from both tribes were contacted by BPA in compliance with NEPA. To date there have been no cultural or religious resources identified at the project site. There will be no ground breaking activities associated with this project, and no known cultural or religious ceremonies proposed for the same time this project is proposed. There will be no impacts to historical, cultural, or religious values.

13. SUMMARY EVALUATION OF SIGNIFICANCE Will the proposed action, considered as a whole:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources, which create a significant effect when considered together or in total.)		X				
b. Involve potential risks or adverse effects, which are uncertain but extremely hazardous if they were to occur?		X				
c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard, or formal plan?		X				
d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X				
e. Generate substantial debate or controversy about the nature of the impacts that would be created?	X	X			Yes	13e
f. Is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e)	X	X				13f
g. List any federal or state permits required.						13g

Comments 13e and f: The use of pesticides can generate controversy from some people. Public outreach and information programs can educate the public on the use of pesticides. It is not known if this project would have organized opposition. One reason that FWP is considering this course of action is based on public requests for quality brook trout fisheries in the Stillwater River drainage. Blue Lake has a history of providing quality brook trout angling. This project would serve to restore the lake to historical conditions.

On July 12, 2006, five anglers who participate in the statewide angler creel survey and who use Blue Lake were contacted by phone to discuss the possibility of restoring a mixed trout fishery to Blue Lake that would include brook, rainbow, and westslope cutthroat trout. These anglers were asked a series of questions, including their concerns with the use of rotenone piscicide to achieve the objectives, and the loss of northern pike and yellow perch from this fishery. Without

exception, this small number of anglers surveyed supported this project as proposed. In part this project was initiated by public requests for a quality brook trout fishery. Blue Lake is one of the few lakes in the area that can support a brook trout fishery while having no impact to bull trout because the lake is isolated with no outlet.

On July 21, 2006, FWP contacted the president of the Tobacco Valley Rod and Gun Club and requested a survey of their membership or interested publics in the Eureka area to learn about local sentiments about the proposed project. On August 3, the president informed the department that the membership was supportive of creating a quality trout fishery that included brook trout.

On August 8, 2006, FWP contacted the owner of Thad's Tackle Shop in Olney to discuss the project. FWP learned that members of the public were interested in allowing jug fishing for pike prior to the proposed action being implemented. FWP does not lift angling method restrictions on this type of activity, and believes that the current limit of 15 pike is high enough to allow angers to harvest pike before the proposed action gets implemented. FWP also discussed sources of brook trout for restocking.

Comment 13g: The following permit would be required:

> DEQ 308 - Department of Environmental Quality (authorization for short-term exemption of surface water quality standards for the purpose of applying a fish toxicant)

The department consulted with the Kootenai National Forest and the Stillwater State Forest during the planning and development phases of this project. No special use permit is required by either agency.

PART III. ALTERNATIVES

Alternative 1 – No Action

The no-action alternative would allow status quo management to continue, which would maintain the present angling quality and species diversity in Blue Lake.

Alternative 2 – Rotenone treatment and restocking with mixed trout fishery (Proposed Action)

The proposed action involves removing the aforementioned species from the lake and stream using Prenfish and Prentox rotenone. Afterwards the lake would be stocked with Kamloops rainbow, brook trout, and westslope cutthroat trout. Based on the depth of this lake, FWP file reports, and reports by anglers, these three species are expected to thrive in this type of lake environment.

This alternative offers the highest probability of achieving the goals of improving and maintaining the fishery in Blue Lake.

Alternative 3 – Mechanical Removal

This alternative would involve using gillnets and/or trap nets to remove the unwanted species of fish, then stocking trout to improve angling quality.

Gillnetting has been used successfully to remove unwanted fish from lakes. Bighorn Lake, a 5.2-acre lake located in Banff National Park in Alberta, Canada, was gillnetted from 1997 to 2000 to remove an unwanted population of brook trout (Parker et al. 2001). Over 10,000 net nights (1 net night = 1 net set overnight for at least 12 hours) were conducted over a 4-year period in Bighorn Lake to remove the population, which totaled 261 fish. The researchers concluded that the removal of nonnative trout using gillnets was impractical for larger lakes (> 5 acres). In clear lakes, trout have the ability to become acclimated to the presence of gillnets and to avoid them. These researchers reported observing brook trout avoiding gillnets within about two hours of being set. It is not known how pike would respond to gillnetting intended for complete removal, but pike are known to be more territorial than trout.

Knapp and Matthews (1998) reported that Maul Lake, a 3.9-acre lake in the Inyo National Forest in California, was gillnetted from 1992 to 1994 to remove a population of brook trout. The population, which totaled 97 fish, was successfully removed with an effort of 108 net days. The researchers reported that following the removal of brook trout from Maul Lake it was mistakenly restocked with rainbow trout. Efforts to remove them using gillnets were implemented immediately. From 1994 through 1997, 4,562 net days were required to remove the 477 rainbow trout from the lake. These researchers reported that gillnets could be used as a viable alternative to chemical treatment. They acknowledged that the small size and shallow depth of Maul Lake leant itself to a successful fish eradication using gillnets. Their criteria for successful fish removal using gillnets include lakes less than 3.9 surface acres, less than 19 feet deep, with little or no inflow or outflow to perpetuate reinvasion, and no natural reproduction. Although not

tested, the maximum size of a lake that they felt could be depopulated using gillnets was 7.4 surface acres and 32 feet deep.

No information was found that described the probability of success with using gillnets or trap nets to completely remove the species present in Blue Lake such as redside shiners, pumpkinseed sunfish, yellow perch, and northern pike. In any event, Blue Lake exceeds both the depth and surface area criteria described by other researchers.

Deploying gillnets and traps requires frequent presence at the site to check and reset nets. There would be an incredible time commitment required to attempt this method of fish removal. Due to these considerations and expected incomplete results, this alternative has a low probability of meeting the objectives.

Alternative 4 – Stocking the lake with brook trout and westslope cutthroat trout in the presence of the existing species.

This alternative involves stocking the lake with brook trout and westslope cutthroat trout in the presence of the other species. One of the species present in Blue Lake, northern pike, is an extremely efficient top-level predator that would benefit from the addition of a forage base such as trout. However, limited spawning habitat would limit pike numbers in the lake, just as it does now. FWP expects this alternative to result in an increase in pike size, but not an increase in pike numbers. Although this alternative may temporarily improve angling quality for both trout and pike, it would require a long term stocking commitment to maintain the trout population as anglers and pike crop them off. Increasing the quality of the pike fishery in Blue Lake is not one of the objectives of this project. Yellow perch and pumpkinseed sunfish are species that easily become stunted and provide little in the way of quality to this type of fishery. The department believes that stocking trout in a lake that contains a high number of stunted perch and pumpkinseeds will not likely result in a quality trout fishery. Redside shiners may provide a forage base for Kamloops rainbow and brook trout, but the presence of this species, in addition to the other species in the lake, is not considered beneficial. Based on these considerations, this alternative has a low probability of meeting the objectives.

Prepared by : Grant G. Grisak Date: August 15, 2006

Submit written comments to: Montana Fish, Wildlife & Parks
c/o Blue Lake fishery Improvement EA Comments
490 North Meridian Road
Kalispell, MT 59901
E-mail: ggrisak@mt.gov
(406) 751-4541

Comment period is 30 days. Comments must be received by Friday, September 15, 2006

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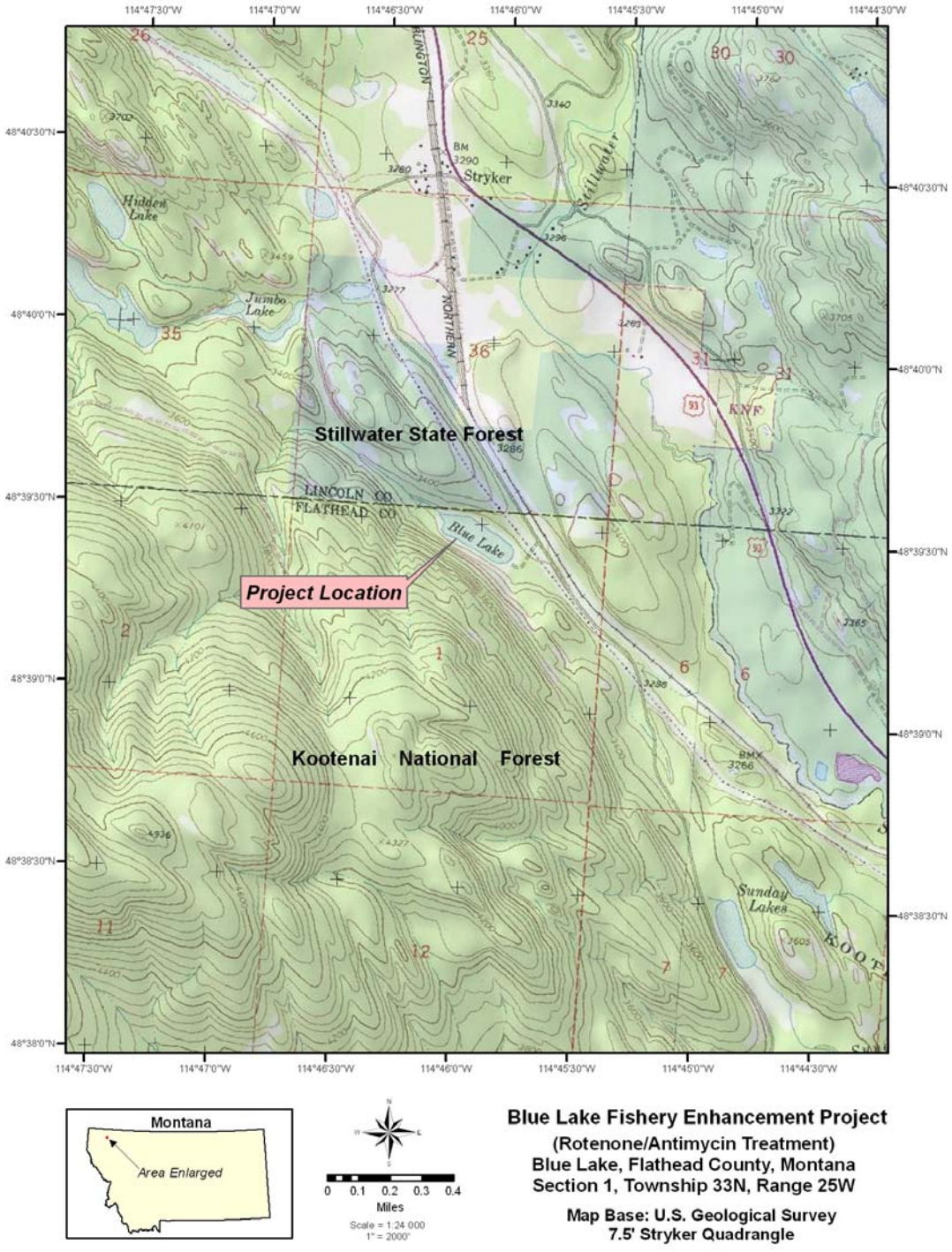

Figure 1. Map of the project site.

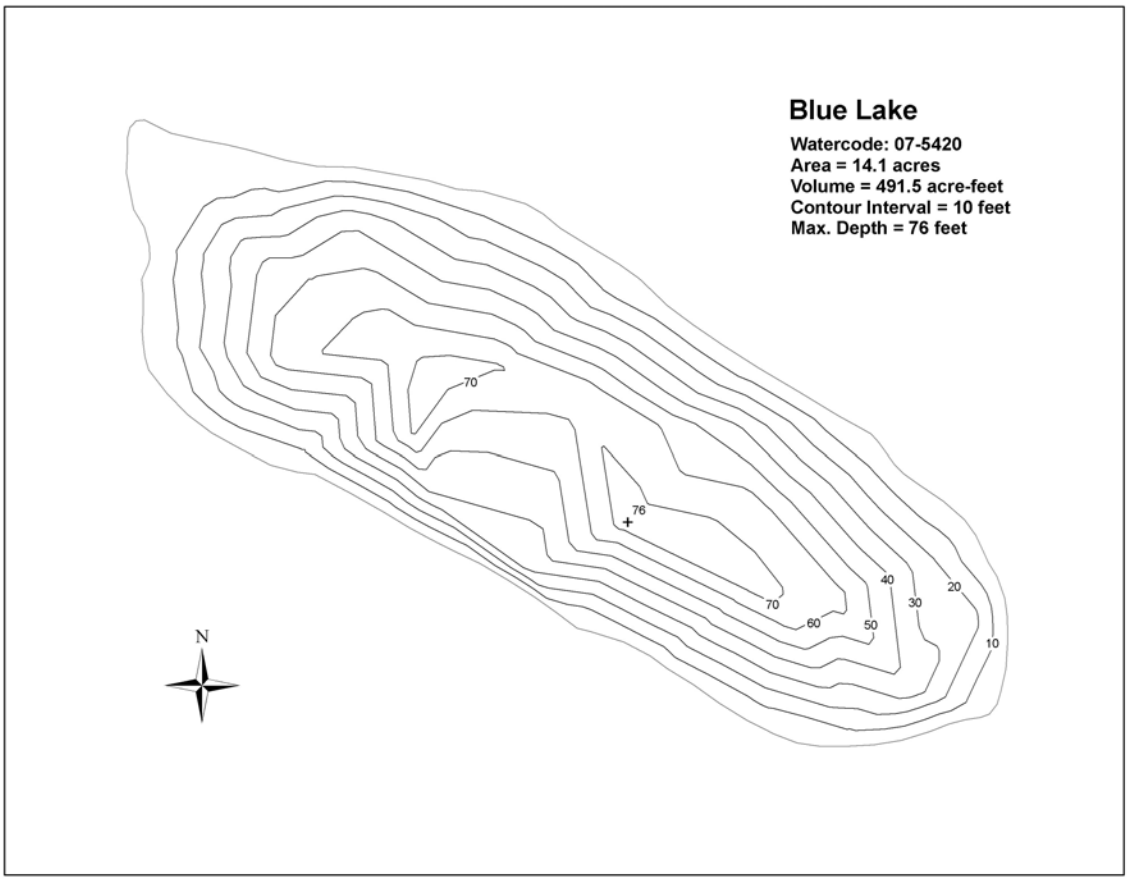

Figure 2. Bathymetric map of Blue Lake.

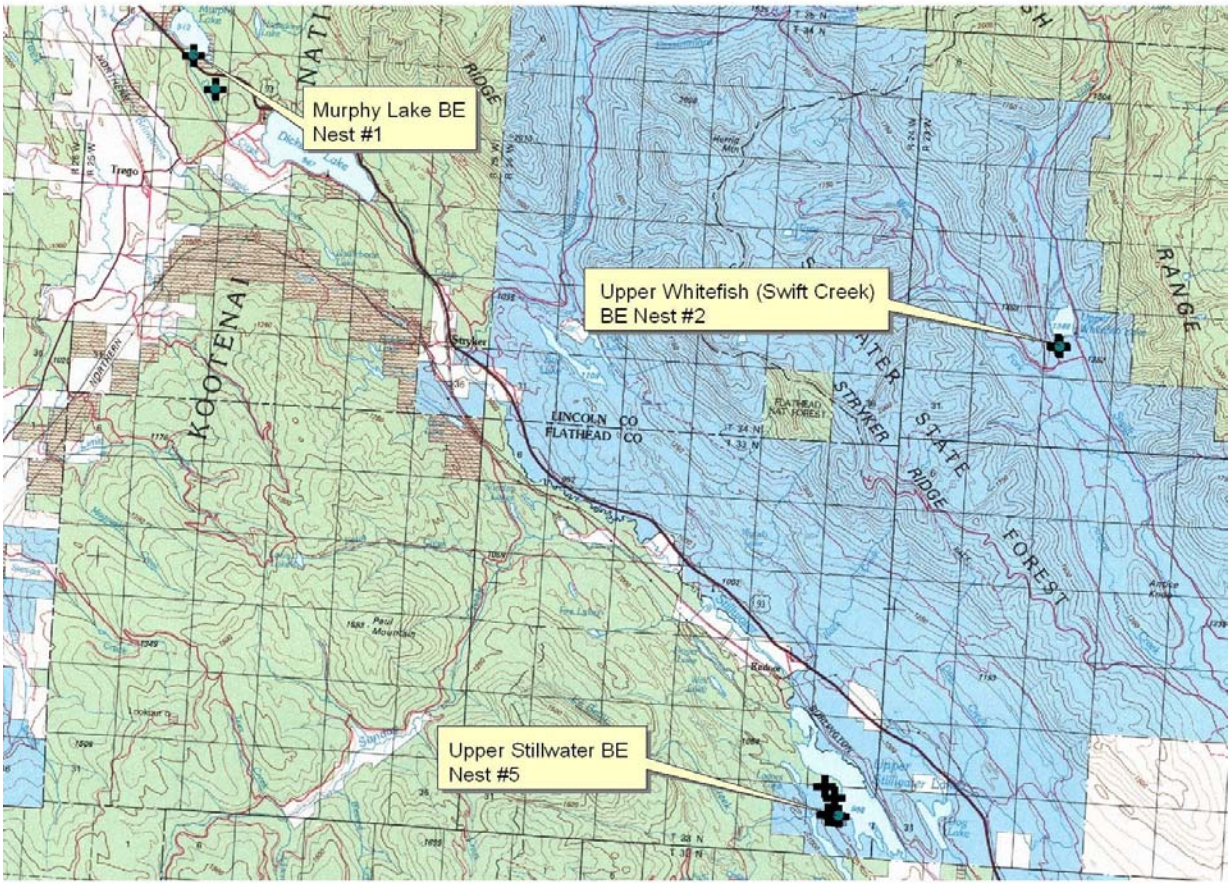

Figure 3. Bald eagle nests in the vicinity of Blue Lake near Stryker, Montana, 2006.